

A Low-Cost, High-Precision Navigator for Unmanned Aircraft, Phase I

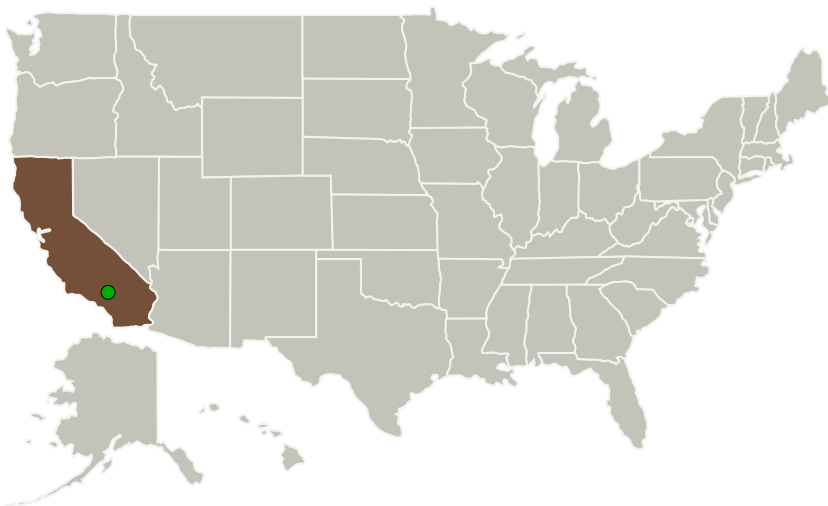


Completed Technology Project (2011 - 2011)

Project Introduction

Toyon Research Corporation proposes to develop a low-cost navigation system for unmanned aerial vehicles (UAVs) that achieves an attitude accuracy of better than 0.1 degrees using commercial-grade gyroscopes and accelerometers. An order of magnitude improvement in navigation performance will be achieved by fusing low-cost inertial sensor measurements with attitude and position measurements from a small-aperture GPS-based attitude (GPS/A) sensor. The Miniature Integrated Direction-finding Attitude-determining Anti-jam System (MIDAAS(TM)) obtains position, velocity, attitude, and time (PVAT) measurements directly from GPS signals. MIDAAS employs an innovative small single-aperture antenna to compute full 3-D attitude (roll, pitch and yaw) using only two RF channels, leading to a smaller, simpler, lower-cost GPS/A receiver system. A stand-alone (gyro-less) MIDAAS unit can also be used to provide attitude information in addition to position and velocity on very small platforms. A unique ultra-tightly coupled (UTC) navigation architecture makes the system inherently more robust to interference and significantly improves the attitude estimate. In addition, MIDAAS provides active anti-jam protection and multipath mitigation thereby further improving the system integrity and robustness. The system performance will be demonstrated during the Phase I effort with data obtained during several flight tests, and will be compared with a higher-accuracy, more expensive GPS/IMU system.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
Toyon Research Corporation	Lead Organization	Industry	Goleta, California
● Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations

California

Project Transitions

▶ **February 2011:** Project Start

✓ **September 2011:** Closed out

Closeout Summary: A Low-Cost, High-Precision Navigator for Unmanned Aircraft, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/140668>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Toyon Research Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

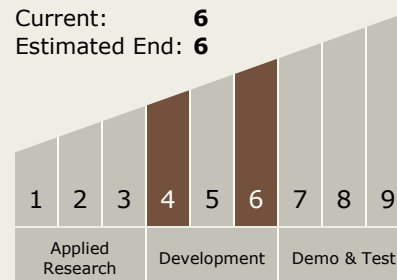
Carlos Torrez

Principal Investigator:

Kenan O Ezal

Technology Maturity (TRL)

Start: 4
Current: 6
Estimated End: 6



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Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
 - └ TX17.4 Attitude Estimation Technologies
 - └ TX17.4.3 Attitude Estimation Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System